UAS and Water Resources

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The Project

- The Great Drone Debate is a project run by high school student debate teams to moderate an on-line discussion of the issues surrounding UAS systems.

- The project is currently working on precision agriculture, water conservation, and the drought.

UAS in Agriculture

Better irrigation scheduling - “timing is everything”

A UAS can monitor:

- Plant stress through color changes in crops
- Broken drip lines
- Uneven field topography
- Harvest winter surplus water for groundwater recharge

Drones can improve water quality

Fertilizer reduction -- only applied where needed

Pesticide use reduced – earlier detection of pests

Salt management – detects poor growth

Environmental Quality

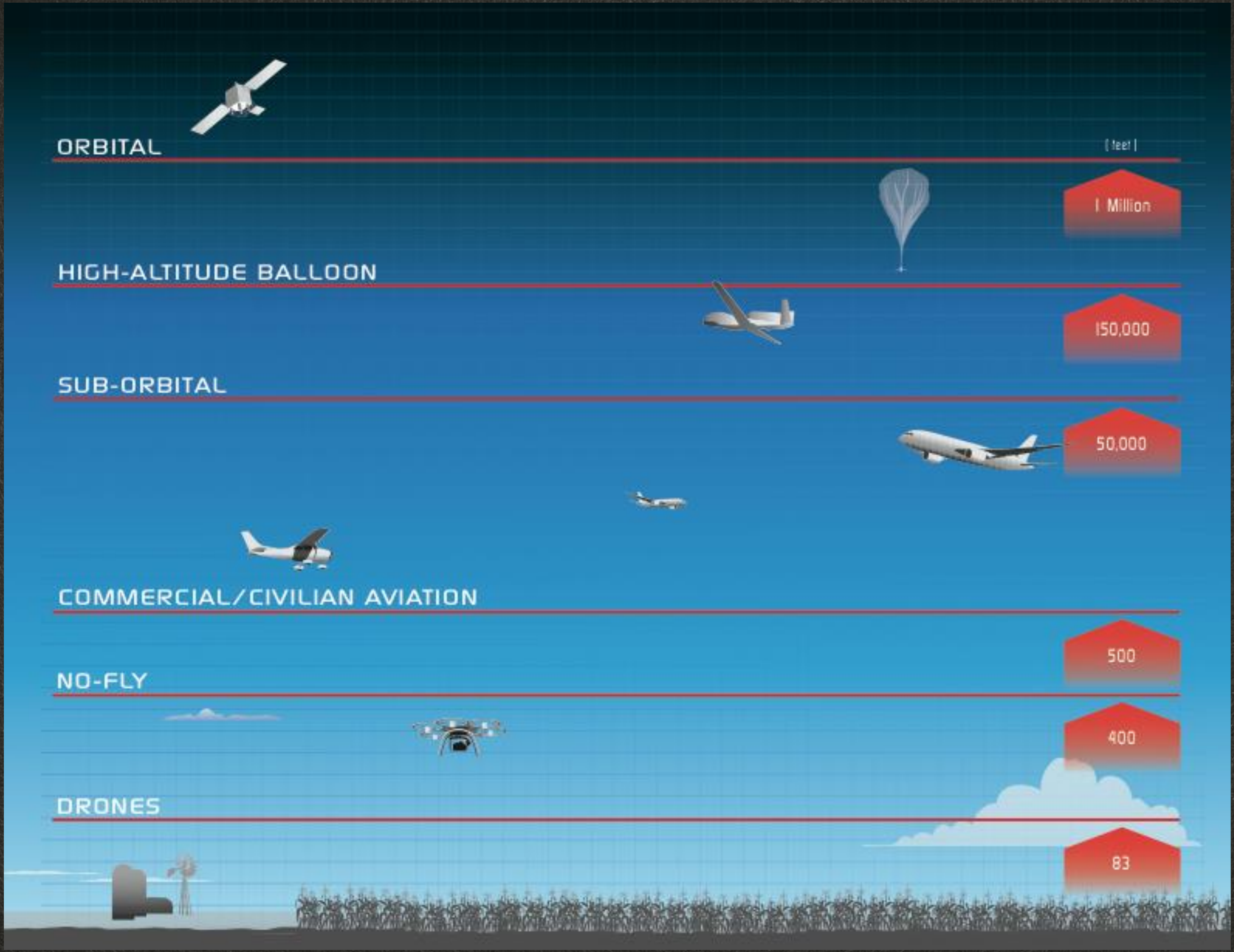
Invasive species

- sUAS can map invasive species:
  - Yellow Star Thistle
  - Arundo
  - Tamarisk
  - Cheatgrass

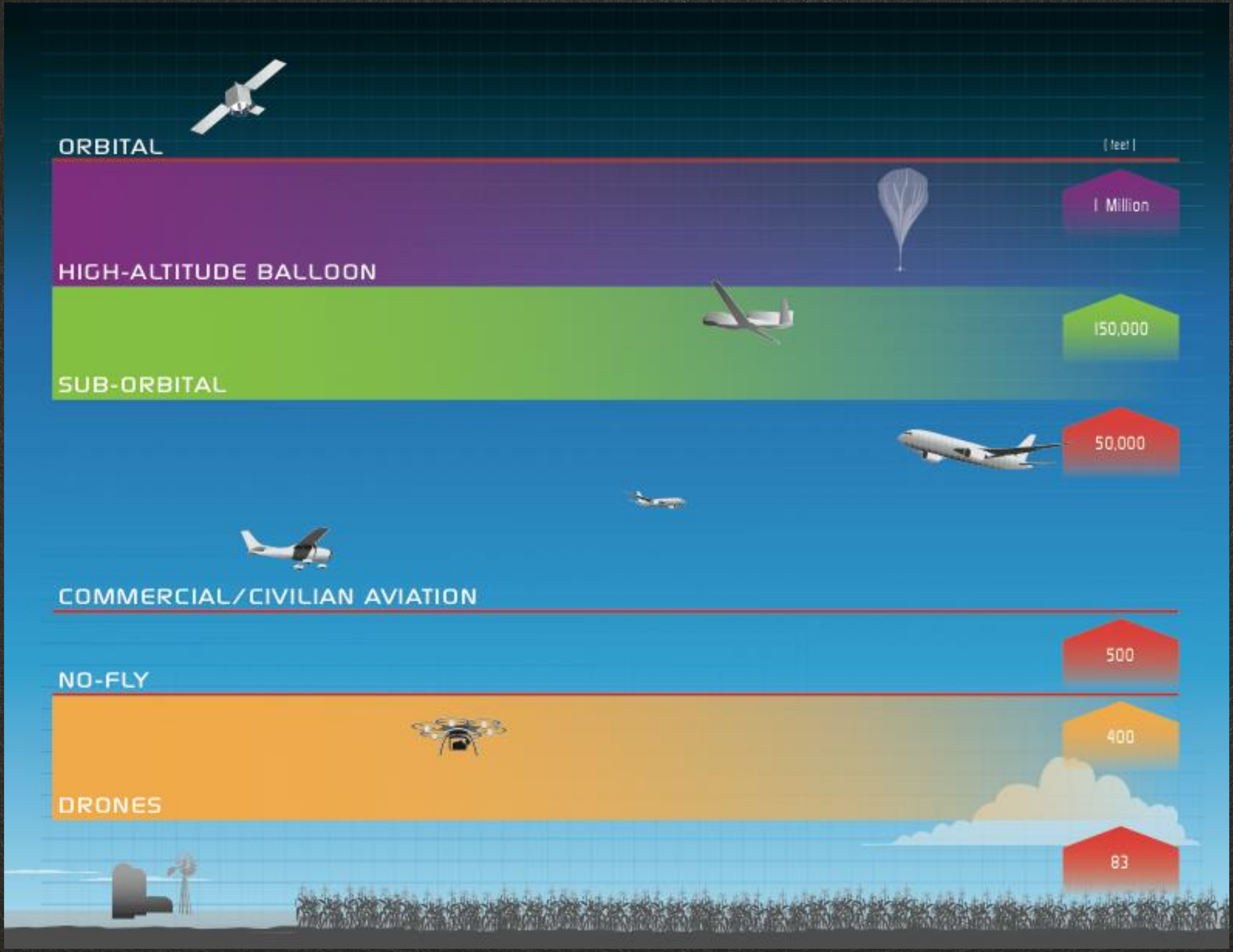
Water Quality

Wetland Restoration

Ways Of Acquiring Imagery



Drone Zones



ORBITAL
[feet]
1 Million
HIGH-ALTITUDE BALLOON
150,000
SUB-ORBITAL
50,000
COMMERCIAL/CIVILIAN AVIATION
500
NO-FLY
400
DRONES
83

A Suborbital Concept

- A constellation of lightweight, solar powered unmanned aircraft that stay aloft for months
- Operates at approximately 60,000 to 65,000 feet AGL
- A suite of miniaturized, low power consumption high resolution imaging sensors
- Flexible and deployable
- Reconfigurable, repairable, upgradeable
- Fraction of the cost of an imaging satellite
- Technology is here, today

Sensor Payload – Electro-Optical

Medusa High Resolution Camera Payload

- Developed specifically for the ZEPHYR by the Flemish National Laboratory, Belgium
- Panchromatic and color images
- Better than 30 cm spatial resolution at 18 km (60,000 ft.)
  - ➢ 60% better resolution than commercially allowed using conventional satellite
- 3 km (1.9 mile) ground swath in a single pass
- Real time transmission of images to ground station using 20 Mbit / second data link combined with LPEG 2000 compression

vito
vision on technology

REMOTE SENSING

MEDUSA-FM

Lightweight high resolution camera for high altitude UAV

Under the ESA-PRODEX program VITO has developed the 2,6 kg high resolution camera system MEDUSA-FM together with a Belgian industrial consortium. The camera is designed to fly on a solar-powered unmanned aerial vehicle (UAV) at stratospheric altitudes between 15-18 km. By means of a custom designed CMOS image sensor it is able to cover a wide swath of 3 km and deliver 30 cm high resolution images (panchromatic and colour) from its operational altitude. The camera system operates autonomously and transmits its data in real-time to a ground control station independent from the platform. It contains a hardware synchronised GPS-IMU system to allow direct georeferencing. The camera is ideally suited for large scale mapping, disaster monitoring and surveillance activities over wide areas.

Top level specifications	
Focal length	330 mm
Mass	2,6 kg
Power consumption	< 40 W
Operational altitude	15 -18 km
Swath (@18 km)	3 km
Ground sampling distance @18 km	30 cm
Spectral range	400-650 nm
Spectral channels	PAN COLOUR (RGB)
Image collection rate	0.7 fps
Realtime data downlink (S-band)	20 Mbps
Direct georeferencing functionality	Hardware synchronised INS
Image compression	JPEG2000
Focal plane size	10000 x 1200 (2 times)

For references, contract terms and additional information, please contact:

Low Altitude Concept

Low altitude drones are already being implemented in selective circumstances

They can…

- Relate watering and nutrient stress actions of crop manager to chart data. Use visual database to finely monitor deliberate stress techniques and management

- Fly the drone weekly to determine watering efficacy. Adjust watering output accordingly

- Software to report on linear and volumetric measurements for insurance reimbursement and detailed topographical maps for historical records.

FAA Proposed Regulations

- Class G Airspace (Away From Airports And Other Hazards)
- Up to 500 feet
- Line Of Sight Operation
- These regulations will take two years to take effect because of public comment

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Our Proposal

- Allow farmer’s to fly their own fields or contract to have their fields flown for the purpose of water conservation.
- Fights would be conducted under the proposed new FAA rules for agriculture but flights would be allowed now before public comment under FAA emergency powers.
- This would only apply to countries in the US deemed to be in drought in February19 NOAA US seasonal drought outlook.
- Wild land managers would be allowed to use UAS for the purpose of fighting invasive weeds.
- Allow University and Governmental Use of sUAS for Drought or precision agriculture activities.

Addition Of New Schools

- We Will Receive Funding From NASA Allowing Us To Bring On Eight Other Schools
- When the funding arrives our project will stop advocacy and host a fair and even handed public debate on different facets of drones
- 1,500 funding for 8 other schools
- If you know a high school that would be interested contact: ryan_darling@sbcglobal.net

Thank you!